

IN THE CLAIMS:

Claims 1-41 canceled.

42. (New) A method of protecting computer data, said method comprising the steps of:

acquiring a first state snapshot S_1 of a first data volume consistent state at a time

t_1 ;

acquiring a second state snapshot S_2 of a second data volume consistent state at a time $t_2 > t_1$;

generating a first precedent snapshot difference list S_{21} comprising an identification of data blocks of said first state snapshot S_1 differing from data blocks in said second state snapshot S_2 ;

creating a first precedent backup B_{21} by copying from said first state snapshot S_1 data blocks identified in said first precedent snapshot difference list S_{21} , said first precedent backup B_{21} further comprising said first precedent snapshot difference list S_{21} ;

utilizing the first precedent backup B_{21} and the first precedent snapshot difference list S_{21} to recover the first state snapshot S_1 following its deletion.

43. (New) The method of claim 42 further comprising the steps of:

acquiring a third state snapshot S_3 of a third data volume consistent state at a time $t_3 > t_2$;

generating a second precedent snapshot difference list S_{32} comprising an identification of data blocks of said second state snapshot S_2 differing from data blocks in said third state snapshot S_3 ; and

creating a second precedent backup B_{32} by copying from said second state snapshot S_2 data blocks identified in said second precedent snapshot difference list S_{32} , said second precedent backup B_{32} further comprising said second precedent snapshot difference list S_{32} .

44. (New) The method of claim 43 further comprising the step of utilizing the second precedent backup B_{32} and the second precedent snapshot difference list S_{32} to recover the third state snapshot S_3 following its deletion.

45. (New) The method of claim 42 further comprising the step of storing said first precedent backup B_{21} in an offline memory unit.

46. (New) The method of claim 45 wherein said offline memory unit is one of a magnetic-based memory unit and an optical-based memory unit.

47. (New) The method of claim 44 further comprising the steps of:

generating a concatenated precedent snapshot difference list S_{31} comprising an identification of said data blocks of said second state snapshot S_2 differing from data blocks in said third state snapshot S_3 and an identification of said data blocks of said first state snapshot S_1 differing from data blocks in said second state snapshot S_2 ;

creating a concatenated backup B_{31} by copying all said blocks in said first precedent backup B_{21} and copying all blocks in said second precedent backup B_{32} not present in said first precedent backup B_{21} ;

copying said first precedent snapshot difference list S_{21} and said second precedent snapshot difference list S_{32} into said concatenated backup B_{31} ; and

storing said concatenated backup B_{31} in an offline memory means.

48. (New) The method of claim 47 further comprising the step of utilizing the third state snapshot S_3 and the concatenated backup B_{31} to recover the first state snapshot S_1 following its deletion.

49. (New) A method of protecting computer data, said method comprising the steps of:

acquiring a base state snapshot S_0 of a data volume base state at a time t_0 ;

acquiring a first state snapshot S_1 of a first data volume consistent state at a time

$t_1 > t_0$;

acquiring a second state snapshot S_2 of a second data volume consistent state at a time $t_2 > t_1$;

generating a first succedent snapshot difference list S_{01} comprising an identification of data blocks of said first state snapshot S_1 differing from data blocks in said base state snapshot S_0 ;

generating a first precedent snapshot difference list S_{21} comprising an identification of data blocks of said first state snapshot S_1 differing from data blocks in said second state snapshot S_2 ;

creating a first composite backup C_{012} by copying from said first state snapshot S_1 data blocks identified in first succedent snapshot difference list S_{01} and copying from said first state snapshot S_1 data blocks identified in said first precedent snapshot difference list S_{21} ;

copying said first succedent snapshot difference list S_{01} and said first precedent snapshot difference list S_{21} into said first composite backup C_{012} ;

utilizing the second state snapshot S_2 and the first composite backup C_{012} to restore the first state snapshot S_1 following its deletion.

50. (New) The method of claim 49 further comprising the steps of:

acquiring a third state snapshot S_3 of a third data volume consistent state at a time $t_3 > t_2$;

generating a second succedent snapshot difference list S_{12} comprising an identification of data blocks of said second state snapshot S_2 differing from data blocks in said first state snapshot S_1 ;

generating a second precedent snapshot difference list S_{32} comprising an identification of data blocks of said second state snapshot S_2 differing from data blocks in said third state snapshot S_3 ;

creating a second composite backup C_{123} by copying from said second state snapshot S_2 data blocks identified in second succedent snapshot difference list S_{12} and copying from said second state snapshot S_2 data blocks identified in said second precedent snapshot difference list S_{32} ; and

copying said second succedent snapshot difference list S_{12} and said second precedent snapshot difference list S_{32} into said second composite backup C_{123} .

51. (New) The method of claim 49 further comprising the steps of:

acquiring a plurality of third through n^{th} state snapshots S_3 through S_n of third through n^{th} data volume consistent states at respective times $t_3 < \dots t_j \dots \leq t_n$;

generating second through $(n-1)^{\text{th}}$ succedent snapshot difference lists S_{12} through $S_{(n-2)(n-1)}$ respectively, a $(j-1)^{\text{th}}$ succedent snapshot difference list $S_{(j-2)(j-1)}$ comprising an identification of data blocks of a $(j-1)^{\text{th}}$ state snapshot $S_{(j-1)}$ differing from data blocks in a $(j-2)^{\text{th}}$ state snapshot $S_{(j-2)}$;

generating second through $(n-1)^{\text{th}}$ precedent snapshot difference lists S_{32} through $S_{(n)(n-1)}$ respectively, a $(j-1)^{\text{th}}$ precedent snapshot difference list $S_{(j)(j-1)}$ comprising an identification of data blocks of a $(j-1)^{\text{th}}$ state snapshot $S_{(j-1)}$ differing from data blocks in a j^{th} state snapshot S_j ;

creating second through $(n-1)^{\text{th}}$ composite backups C_{123} through $C_{(n-2)(n-1)(n)}$, wherein a $(j-1)^{\text{th}}$ composite backup $C_{(j-2)(j-1)(j)}$ is created by copying from said $(j-1)^{\text{th}}$ state snapshot $S_{(j-1)}$ data blocks identified in said $(j-1)^{\text{th}}$ succedent snapshot difference list $S_{(j-2)(j-1)}$ and copying from said $(j-1)^{\text{th}}$ state snapshot $S_{(j-1)}$ data blocks identified in said $(j-1)^{\text{th}}$ precedent snapshot difference list $S_{(j)(j-1)}$; and

copying said succedent snapshot difference lists S_{12} through $S_{(n-2)(n-1)}$ and said precedent snapshot difference lists S_{32} through $S_{(n)(n-1)}$ into said respective composite backups C_{123} through $C_{(n-2)(n-1)(n)}$.

52. The method of claim 51 further comprising the steps of:

assigning a unique identifier to each said state snapshot S_j ;

for each said composite backup $C_{(j-2)(j-1)(j)}$, identifying said state snapshots $S_{(j-2)}$ and S_j as difference snapshots and said $(j-1)^{\text{th}}$ state snapshot $S_{(j-1)}$ as a content snapshot;

for each said composite backup $C_{(j-2)(j-1)(j)}$, copying the unique identifiers of said state snapshots $S_{(j-2)}$, $S_{(j-1)}$, and S_j into said $(j-1)^{\text{th}}$ composite backup $C_{(j-2)(j-1)(j)}$.

53. (New) The method of claim 52 further comprising the step of comparing the unique identifier of said j^{th} snapshot S_j to the unique identifiers of the difference snapshots of said $(j-1)^{\text{th}}$ composite backup $C_{(j-2)(j-1)(j)}$.